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ABSTRACT

Four-hundred and nine students (grades 8, 10, 12 and 14) were given logical syllogism problems of the form "If p...then q" along with tests of dogmatism and intolerance of ambiguity. Aptitude scores were also obtained. Major results indicated that expressed dogmatism and intolerance of ambiguity were negatively correlated with syllogistic reasoning for subjects in each grade, although general aptitude accounted for most of the variance. All 14th graders were significantly less dogmatic and more tolerant of ambiguity, but there was no consistent developmental trend across the other grades. The Dogmatism Scale, Intolerance of Ambiguity Scales and the Deductive Reasoning Test used in this study are contained in the Appendix. (Author/MLP)

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SOME PERSONALITY CORRELATES OF LOGICAL REASONING ABILITY

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ABSTRACT

Four-hundred and nine students (grades 8, 10, 12, and 14) were given logical syllogism problems of the form "If p . . . then q" along with tests of dogmatism and intolerance of ambiguity. Aptitude scores were also obtained. Major results indicated that expressed dogmatism and intolerance of ambiguity were negatively correlated with syllogistic reasoning for subjects in each grade, although general aptitude accounted for most of the variance. 14th graders were significantly less dogmatic and more tolerant of ambiguity, but there was no consistent developmental trend across the other grades.

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INTRODUCTION

The reasoning process is of fundamental importance in many educational tasks. Research on reasoning as a psychological phenomena has usually been concerned with performance on a set of conditional syllogisms, with the effect of either task variables or organismic variables being of primary interest. This study investigated certain organismic variables as they relate to reasoning performance. (See Wildman, 1974, for a discussion of task variables).

One organismic variable which has been studied in relation to logical reasoning is intolerance of ambiguity. The differences in abstract reasoning ability among individuals who exhibited varying degrees of intolerance of ambiguity (defined as a tendency to avoid ambiguous stimuli) were studied by O'Connor (1952). Her results indicated that intolerance of ambiguity was negatively correlated with the ability to reason abstractly. Feather (1964) investigated the relationships between reasoning ability and "intolerance of inconsistency" (highly correlated with intolerance of ambiguity) and found similarly that syllogistic reasoning was negatively correlated with intolerance of inconsistency. Moreover, Steinfatt (1971) has shown that the difficulty of a syllogism is a function of its ambiguity. These studies suggest that intolerance of ambiguity is an important correlate of syllogistic reasoning, especially when the syllogism is ambiguous.

Another organismic variable which evidently relates to logical reasoning is dogmatism (defined briefly as closed-mindedness). The relationship between the degree of dogmatism and the ability of the S to differentiate source and content of a syllogism was investigated by Powell (1962). Results indicated that highly dogmatic Ss tended to make judgments of logical validity depending on the source of a syllogism, whereas low-dogmatic Ss were better able to judge logical validity. In a well-controlled study, Bettinghaus, et. al. (1970) also found that highly dogmatic Ss will make significantly less accurate judgments of logical validity than will low dogmatic Ss. Others have found a significant negative correlation between dogmatism and interpretation of logical arguments (Luck and Grunner, 1970) and between dogmatism and the ability to solve complex logical problems.

Thus, while it is apparent that dogmatism and intolerance of ambiguity relate to logical reasoning ability, previous studies typically used syllogisms with emotional/controversial premisses as the criterion task. Correlations between dogmatism, intolerance of ambiguity, and performance on emotional/controversial syllogisms have been used to infer that dogmatism and intolerance of ambiguity are related to reasoning ability. However, performance on syllogisms which have premisses of a socially-controversial nature is probably not indicative of a subject's performance on a neutral syllogism task.

Finally, another weakness in this field may be an over emphasis on personality correlates at the expense of intellectual correlates and age.

This study employed the neutral syllogism task to investigate the relationship between intolerance of ambiguity, dogmatism, and logical reasoning. Additionally, the developmental trends in these two personality variables were also examined.

METHOD

Subjects

A total of 409 Ss were tested, including 57, 192, 118, and 42 in the 8, 10, 12, and 14th grades, respectively. All 8th grade Ss came from the laboratory school associated with Florida State University having racial composition of 82% white and 18% black. Tenth graders were from two schools: 117 from a large (2300) urban public high school in Florida; the remaining 75 from the laboratory school cited above. Racial composition was 54% white and 46% black subjects. Twelfth graders were from the two schools above: 62 were from the public high school, and the remaining 56 from the laboratory school. Racial composition was 74% white and 26% black. Fourteenth graders (college sophomores) were enrolled in two introductory psychology courses. Racial composition was 93% white and 7% black. In the total sample, there were 231 male and 178 female Ss, with 282 white and 127 black Ss.

Stimuli

For the purposes of this study, the following variables are defined in terms of their respective measuring instruments:

Dogmatism score was the S's total score on the 20 item short-form Dogmatism scale reported by Throldahl & Powell (1965). This

scale is adapted from Rokeach's original dogmatism scale (1960). Throldahl & Powell report reliabilities in the range of .90 for this instrument. Sample items were:

(1) In this complicated world of ours the only way we can know what's going on is to rely on leaders or experts who can be trusted.

(2) My blood boils whenever a person refuses to admit he's wrong.

The Ss responded on a 1-5 Agree/Disagree scale. (See Appendix A).

Aptitude scores were (1) Ss' percentiles on the Florida 12th Grade Aptitude Test for 12th graders, including verbal, quantitive, and total scores (2) Ss' percentiles on the Florida 9th Grade Aptitude Test for 10th graders, and (3) Ss' percentiles on the Florida 8th Grade Aptitude Test for 8th graders. The three tests mentioned above are measures of general academic aptitude, and are given to all Florida high school students in the appropriate grade.

Two scales of intolerance of ambiguity were administered: A 16-item scale developed by Budner (1962); and an 8-item scale developed by Walk (1950). These tests will be referred to as IA1 and IA2, respectively. Sample items were:

(1) An expert who doesn't come up with a definite answer probably doesn't know too much. (Budner scale).

(2) There is more than one right way to do anything. (Walk scale). (See Appendix B).

Logical reasoning ability was defined as total number correct on a 16-item logical syllogism test composed of two general types. Type I syllogisms yielded definite logical conclusions, such as

If this is brown, it is a square.
This is brown.

Conclusion:

a. definitely it is square
b. definitely it is not square
c. no definite conclusion possible

Type II syllogisms had no definite logical conclusion possible, such as

If this is brown, it is a square.
This is square.

Conclusion:

a. definitely it is brown
b. definitely it is not brown
c. no definite conclusion possible

Type II syllogisms were considered to present the S with an ambiguous stimulus, and will be referred to as the "ambiguous items". For both Type I and Type II syllogisms, the S's task was to read each syllogism and pick the logically correct conclusion. (See Appendix C).

Procedure

All Ss were told E was interested in studying the way people reason and their attitudes. They were then given a test booklet containing the syllogism test, dogmatism scale, IA1 scale, and IA2 scale, and instructed to work straight through the booklet. No time limit was set; however, the average time was approximately 45 minutes. Aptitude scores were obtained from permanent school records.

RESULTS AND DISCUSSION

Preliminary tests

There were four random arrangements of the syllogism items. A one-way ANOVA on total number correct indicated that there was no difference between forms, hence in subsequent analyses no distinction was made between forms. Also, Ss were asked if they had previously taken a formal course in logic or not. No significant difference was found between Ss who indicated they had taken a logic course and those who had not, therefore these Ss were kept in the study.

Developmental results

As an indication of a trend in the development of dogmatism as a personality variable, mean dogmatism scores were computed for each grade level. Table 1 presents these means. Each item on the 20-item Dogmatism scale was scored on a 1-5 scale, with a maximum score being 100 and representing high dogmatism.

Table 1. Mean scores on the dogmatism scale.

	Grade			
	8	10	12	14
n	57	192	118	42
$\bar{x}$	38.3	41.1	37.1	27.5
s	10.5	12.0	10.8	8.5

An analysis of variance was performed on the data in Table 1, and results revealed a significant grade effect (F =19.8;

df = 3,405; p < .01). Multiple comparisons indicated the 14th grade mean was significantly lower than the 12th (t = 5.78; df = 158, p < .01) and the 12th grade mean to be significantly lower than the 10th (t = 3.03; df = 308; p < .01).

These results indicate a trend toward lower expressed dogmatism beginning with the 10th grade. The significantly lower 14th grade mean may be the result of factors such as Ss attempting to make themselves appear less dogmatic.

Further, these is evidence that dogmatism and general aptitude are not independent. Table 2 shows the correlations between dogmatism and general aptitude across grade level (aptitude scores were unavailable for 14th graders).

Table 2. Product--moment correlation between dogmatism and general aptitude.

	Grade			
	8	10	12	
r	-.64	-.54	-.54	(All p < .01)

It seems plausible that the drop in the 14th grade may be an artifact of the academic selection involved in college attendance.

The developmental trend in intolerance of ambiguity is also of interest. Mean scores on the intolerance of ambiguity (Scale 1) were also computed for each grade level, and are presented in Table 3. Each item on the 20-item IA1 scale was scored on a 1-5 Agree/Disagree scale, with a maximum score being 100, and representing high intolerance.

Table 3. Mean scores on the intolerance of ambiguity scale (scale 1).

	Grade			
	8	10	12	14
n	57	192	118	42
$\bar{x}$	27.7	28.1	26.7	22.0
s	5.2	6.6	6.3	5.8

An analysis of variance was performed on the data in Table 3, and results revealed a significant grade effect (F = 10.8, df = 3,405; $p < .01$). Multiple comparisons indicated the 14th grade mean was significantly lower than the 12th (t = 4.39; df = 158, $p < .01$). There is evidently a trend toward lower intolerance of ambiguity scores beginning in the 12th grade.

The significant drop in intolerance of ambiguity for 14th graders may be due to the effects of the selection process involved in college admission, the social-desirability of appearing tolerant, or the relationship between intolerance of ambiguity and general aptitude. Table 4 shows the correlation between intolerance of ambiguity and general aptitude across grade level (aptitude scores were unavailable for 14th graders).

Table 4. Product--moment correlation between intolerance of ambiguity and total aptitude.

	Grade			
	8	10	12	
r	-.43	-.46	-.58	(All $p < .01$)

The significant negative correlation between intolerance of ambiguity and aptitude may partially explain the lower 14th grade mean.

Furthermore, there is evidence that the dogmatism and intolerance of ambiguity scales are not independent measures. The correlations between scores on the dogmatism scale are shown for each grade level in Table 5.

Table 5. Product--moment correlation between intolerance of ambiguity and dogmatism.

	Grade			
	8	10	12	14
r	.37	.44	.53	.28 (NS)

($p < .05$)

All correlations were significantly different from zero except for the 14th graders.

From the preceding discussion, it is evident that dogmatism and intolerance of ambiguity are both negatively correlated with aptitude, positively correlated with each other, and that both variables decrease for 14th graders. If we assume that college selection increases the mean aptitude for 14th graders (and therefore decreases intolerance), then the developmental trends noted may be the result of college selection. Two alternate explanations of the developmental trend are that 14th graders are genuinely less dogmatic and less intolerant of ambiguity, or that 14th graders are influenced by the social desirability of appearing non-dogmatic and tolerant of ambiguity.

Multiple Regression Results

The main purpose of this study was to examine the linear relationships between aptitude, dogmatism, intolerance of ambiguity, and performance on a logical reasoning task. Previous research has

not made it clear what part aptitude may play in the prediction of reasoning ability.

Zero-order correlations were computed between dogmatism, IA1, total syllogism, and ambiguous syllogism scores as an indication of linear relationships existing without consideration of aptitude. Results of this computation are presented in Table 6.

Table 6. Product--moment correlation between dogmatism (DG), intolerance of ambiguity (IA1), total syllogism score (TOT), and ambiguous item score (AMB). (N=409)

	1	2	3	4
DG	1.0			
IA1	.49	1.0		
TOT	-.40	-.35	1.0	
AMB	-.21	-.21	.68	1.0

(All $p = <.01$)

Table 8 is presented as a base-line for the multiple regression analysis which follows, which includes three types of aptitude scores as covariates. Approximately 12% of the variance in total syllogism performance is explained by intolerance of ambiguity scores, with dogmatism scores accounting for 16%, indicating that these two variables are significantly inversely related to logical reasoning.

Stepwise regression analysis is a technique to demonstrate the order in which predictor variables enter the prediction equation, with the predictor variable which accounts for the most variance in the dependent variable entered first, etc. The second variable entered is that independent variable which most reduces the error

variance with variable one remaining in the model. Stepwise regression analyses were first performed by grade using both white and black Ss. These results are coded "8-T" or "10-T" etc. in Table 7. Examination of the data revealed differences between white and black Ss on total syllogism score, therefore subsequent analyses were performed using only white Ss. These results are coded "8W-T" or "10W-T" in Table 7. The letter A instead of T, e.g. "8W-A" indicates that the dependent variable was the ambiguous item score. R stands for cummulative multiple correlation after each step.

	STEP 1		STEP 2		STEP 3		STEP 4			
GROUP	VAR Entered	R	VAR Entered	R	VAR Entered	R	VAR Entered	R	n	Critical Values
8-T	QA	.41	VA	.43	IA1	.43	TA	.43	52	.273=5% .354=1%
8W-T	QA	.40	IA2	.43	VA	.44	TA	.44	43	.304=5% .393=1%
8-A	QA	.33	IA2	.35	DG	.35	VA	.35	52	
8W-A	QA	.40	IA2	.41	DG	.42	TA	.42	43	
10-T	TA	.49	VA	.50	QA	.51	IA2	.51	153	.159=5% .208=1%
10W-T	QA	.49	VA	.50	TA	.50	IA2	.50	83	.217=5% .283=1%
10-A	IA1	.08	QA	.16	IA2	.17	DG	.17	153	
10W-A	QA	.29	IA2	.31	IA1	.32	DG	.32	83	
12-T	TA	.62	IA1	.62	DG	.62	IA2	.62	98	.205=5% .267=1%
12W-T	TA	.59	QA	.59	VA	.59	IA1	.59	73	.232=5% .302=1%
12-A	TA	.44	IA1	.44	QA	.44	VA	.44	98	
12W-A	TA	.47	IA1	.48	IA2	.48	DG	.48	73	
14-T	DG	.46	IA1	.52	IA2	.52			42	.304=5% .393=1%
14W-T	DG	.45	IA1	.52	IA2	.52			39	.325=5% .418=1%
14-A	DG	.50	IA1	.59	IA2	.59			42	
14W-A	DG	.49	IA1	.60	IA2	.61			39	

(Aptitude scores were unavailable for 14th graders)

Table 7. Results of stepwise regression analyses.

TA = Total aptitude
VA = Verbal aptitude
QA = Quantitative aptitude
DG = Dogmatism scale
IA1 = Intol. of ambiguity scale 1
IA2 = Intol. of ambiguity scale 2

The best predictor of syllogistic reasoning performance was general aptitude (in those grades where aptitude scores were available), suggesting that the neutral syllogism task is primarily a cognitive task. The second variable entered was either aptitude or intolerance of ambiquity, but these two variables appeared to enter randomly across subject classifications. It is also interesting to note that the multiple R for 12th graders on total syllogism score averaged .61, accounting for approximately 36% of the variance, and that the multiple R for 14th graders (using only the predictors DG, IA1, and IA2) averaged .52 for total score, and .61 for ambiguous items, without aptitude measures being considered. Apparently, therefore, dogmatism was as good a predictor of reasoning for 14th graders as aptitude was for 8, 10, and 12th graders. In general, however, aptitude measures were the best single predictor of reasoning performance. It is reasonable to assume that if aptitude scores were available for 14th graders, a similar relationship would be found.

An alternate way to demonstrate the amount of variance in logical reasoning scores accounted for by dogmatism and intolerance of ambiguity scores is by analysis of variance. The subjects were split (at the mean) into two groups on the basis of their score on the dogmatism scale. Table 8 presents the means for each group on the logical reasoning instrument (16 items, scored as number correct) and on those items termed ambiguous (8 items, scored as number correct).

Table 8. Mean number of correct responses of high dogmatism group vs low dogmatism group on total syllogism score and on ambiguous item score.

	Low Dogmatism Group	High Dogmatism Group
n	213	196
$\bar{x}$ (TOT)	8.4	6.7
s (TOT)	2.8	2.1
$\bar{x}$ (AMB)	2.8	2.0
s (AMB)	2.6	2.2

An analysis of variance performed on the data in Table 8 indicated that the low dogmatism group scored significantly higher on total syllogism score ($F = 50.3$; $df = 1,407$; $p < .01$) and on the ambiguous items ($F = 11.0$; $df = 1,407$; $p < .01$) than did the high dogmatism group. This is further evidence that dogmatism is related to logical reasoning performance.

Similarly, subjects were split (at the mean) into two groups on the basis of their IA1 scores, the means of which are presented in Table 9.

Table 9. Mean scores of High IA group vs low IA group on total syllogism score and on ambiguous item score.

	Low IA group	High IA group
n	178.	231
$\bar{x}$ (TOT)	8.6	6.8
s (TOT)	2.9	1.9
$\bar{x}$ (AMB)	3.1	1.9
s (AMB)	2.7	2.2

An analysis of variance was performed on the data in Table 9. Results indicated that low IA group scored significantly higher on total syllogism score ($F = 52.7$; $df = 1,407$; $p < .01$) and on the ambiguous items ($F = 21.4$; $df = 1,407$; $p < .01$) than did the high IA group. These results (Tables 7, 8, and 9) suggest that dogmatism and intolerance of ambiguity are significant predictors of performance on the neutral syllogism task, but that the major proportion of the variance in syllogistic reasoning is accounted for by aptitude.

IMPLICATIONS

The variables of expressed dogmatism and intolerance of ambiguity are significant predictors of performance on the neutral syllogism task for 8, 10, 12 and 14th graders. However, when aptitude is added to these two variables in a multiple regression context syllogistic performance is best predicted by aptitude scores.

Earlier research showed that personality variables were important predictors of performance level on syllogisms which contained emotive content. The present results show similar correlations with neutral syllogisms. Therefore the relationships between logical reasoning and the personality variables of dogmatism and intolerance of ambiguity hold for both emotional and non-emotional syllogistic content.

More importantly, this research implies that, when personality variables and general aptitude are strongly related, research which classifies subjects according to various levels of a personality variable has the effect of classifying subjects on intellectual ability. Thus, the variance in reasoning ability which has previously been attributed to personality factors may simply be a result of differential ability level.

From an educational viewpoint, this study shows that variables other than aptitude may be related to students' performance on reasoning tasks. Further research needs to investigate these personality variables using instruments which are relatively independent of aptitude. Until that research is completed, it would be premature to recommend any changes in instructional procedures.

Specifically, some areas for further research are

(1) to determine if better prediction can be obtained through the use of more independent personality factors. (The amount of variance accounted for by aptitude scores is around 25%, indicating that there may be other personality variables which might give better prediction than aptitude scores.) Personality instruments which have a background of extensive validation studies (e.g. the California Personality Inventory) may produce more reliable data.

(2) to determine if different relationships exist when inductive problems are the criterion variable. Inductive tasks require the S to form various hypotheses. Interesting variables would be the time between persentation of unrelated stimuli and formation of first hypothesis. These variables may correlate with certain personality measures mentioned in (1).

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APPENDIX A

Dogmatism Scale

1. agree very much
2. agree somewhat
3. neither agree or disgree
4. disagree somewhat
5. disagree very much

21. In this complicated world of ours the only way we can know what's going on is to rely on leaders or experts who can be trusted.

22. My blood boils whenever a person refuses to admit he's wrong.

23. There are two kinds of people in this world: those who are for the truth and those who are against the truth.

24. Most people just don't know what's good for them.

25. Of all the different philosophies which exist in this world there is probably only one which is correct.

26. The highest form of government is a democracy and the higher form of democracy is a government run by those who are most intelligent.

27. The main thing in life is for a person to want to do something important.

28. I'd like it if I could find someone who would tell me how to solve my personal problems.

29. Most of the ideas which get printed nowaday aren't worth the paper they are written on.

30. Man on his own is a helpless and miserable creature.

31. It is only when a person devotes himself to an ideal or cause that life becomes meaningful.

32. Most people just don't give a "damn" for others.

33. It is often describe to reserve judgement about what's going on until one has had a chance to hear the opinions of those one respects.

34. To compromise with our political opponents is dangerous because it usually leads to the betrayal of our own side.

35. The present is all too often full of unhappiness. It is only the future that counts.

36. The United Statesand Russia have just about nothing in common.

37. In a discussion I often find it necessary to repeat myself several times to make sure I am being understood.

38. While I don't like to admit this even to myself, my secret ambition is to become a great men, like Einstein, or Beethoven, or Shakespeare.

39. Even though freedom of speach for all groups is a worthwhile goal, it is unfortunately necessary to restrict the freedom of certain political groups.

40. It is better to be a dead hero than to be a live coward.

APPENDIX B

INTOLERANCE OF AMBIGUITY I SCALE

(Budner Scale)

41. An expert that doesn't come up with a definite answer probably doesn't know too much.

42. There is really no such thing as a problem that can't be solved.

43. A good job is one where what is to be done and how it is to be done are always clear.

44. In the long run it is possible to get more done by tackling small, simple problems rather than larger and complicated ones.

45. What we are used to is always preferable to what is unfamiliar.

46. A person who leads an even, regular life in which few surprises or unexpected happenings arise, really has a lot to be grateful for.

47. I like parties where I know most of the people more than ones where all or most of the people are complete strangers.

48. The sonner we all acquire similar values and ideals the better.

49. I would like to live in a foreign country for awhile.

50. It is more fun to tackle a complicated problem than to solve a simple one.

51. People who fit their lives to a schedule probably miss most of joy of living.

52. Often the most interesting and stimulating people are those who don't mind being different and original.

53. People who insist on a yes or no answer just don't know how complicated things really are.

54. Many of our most important decisions are based upon insufficient information.

55. Teachers or supervisors who had out vague assignments give a chance for one to show initiative and originality.

56. A good teacher is one who makes you wonder about your way of looking at things.

APPENDIX B (con't)

Intolerance of Ambiguity II Scale

(Walk Scale)

57. There is more than one right way to do anything.

58. It is always better to have a definite course of action than to be vacillating among several possibilities.

59. The best leaders give specific enough instructions so that those under them have nothing to worry about.

60. Nobody can have feelings of love and hate toward the same person.

61. A smart person gets his life into a routine so that he is not always bothered by petty details.

62. It is better to keep on with the present method of doing things than to take a way that might lead to chaos.

63. A man can be well informed even if there are many subjects upon which he does not have a definite opinion.

64. It is better to take a chance on being a failure than to let your life get into a rut.

APPENDIX C

DEDUCTIVE REASONING TEST

PART I - DIRECTIONS

This part contains 16 problems which require you to draw the best, or most logical, conclusion. Each problem will begin with two simple and true statements. After reading these statements, your task will be to choose from among 3 possible conclusions the one which you think is the most logical conclusion based upon the information given in the two statements. All problems will look like this:

If it is a bird, then it is an animal.
It is a bird.
Conclusion:
1. Definitely it is an animal
2. Definitely it is not an animal
3. No definite conclusion possible

In the above example if, after reading the first two statements, you are convinced that it obviously must be an animal, then you would choose "1. Definitely it is an animal." Or, if you think that the information in the first two statements forces you to conclude that it logically cannot possibly be an animal, then you would choose "2. Definitely it is not an animal." Or, if you conclude that either of choices 1 or 2 might logically be correct, that the information in the first two statements does not allow a clear choice, then you would choose "3. No definite conclusion possible."

Again, your task is to choose the one conclusion which you think logically follows from the first two statements.

There are no tricky problems. All can be solved by reasoning logically. Some problems are easy, some are relatively difficult, and these have been mixed up throughout the list.

Work carefully, but work as fast as you can.

Do not skip any questions.

DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.

" DO NOT MARK ON THIS TEST BOOKLET "

1. If it is brown, then it is a square. It is brown.
   Conclusion:
   1. definitely it is a square.
   2. definitely it is not a square.
   3. no definite conclusion possible.

2. If it is brown, then it is not a square. It is brown.
   Conclusion:
   1. definitely it is a square.
   2. definitely it is not a square.
   3. no definite conclusion possible.

3. If it is not brown, then it is a square. It is not brown.
   Conclusion:
   1. definitely it is a square.
   2. definitely it is not a square.
   3. no definite conclusion possible.

4. If it is not brown, then it is a square. It is brown.
   Conclusion:
   1. definitely it is a square.
   2. definitely it is not a square.
   3. no definite conclusion possible.

5. If it is not brown, then it is not a square. It is not a square.
   Conclusion:
   1. definitely it is brown.
   2. definitely it is not brown.
   3. no definite conclusion possible.

6. If it is brown, then it is a square. It is not a square.
   Conclusion:
   1. definitely it is brown.
   2. definitely it is not brown.
   3. no definite conclusion possible.

7. If it is brown, then it is not a square. It is a square.
   Conclusion:
   1. definitely it is brown.
   2. definitely it is not brown.
   3. no definite conclusion possible.

8. If it is brown, then it is a square. It is not brown.
   Conclusion:
   1. definitely it is a square.
   2. definitely it is not a square.
   3. no definite conclusion possible.

9. If it is not brown, then it is not a square. It is a square.
Conclusion:
1. definitely it is brown.
2. definitely it is not brown.
3. no definite conclusion possible.

10. If it is brown, then it is not a square. It is not a square.
Conclusion:
1. definitely it is brown.
2. definitely it is not brown.
3. no definite conclusion possible.

11. If it is not brown, then it is a square. It is a square.
Conclusion:
1. definitely it is brown.
2. definitely it is not brown.
3. no definite conclusion possible.

12. If it is brown, then it is not a square. It is not brown.
Conclusion:
1. definitely it is a square.
2. definitely it is not a square.
3. no definite conclusion possible.

13. If it is not brown, then it is not a square. It is brown.
Conclusion:
1. definitely it is a square.
2. definitely it is not a square.
3. no definite conclusion possible.

14. If it is not brown, then it is not a square. It is not brown.
Conclusion:
1. definitely it is a square.
2. definitely it is not a square.
3. no definite conclusion possible.

15. If it is brown, then it is a square. It is a square.
Conclusion:
1. definitely it is brown.
2. definitely it is not brown.
3. no definite conclusion possible.

16. If it is not brown, then it is a square. It is not a square.
Conclusion:
1. definitely it is brown.
2. definitely it is not brown.
3. no definite conclusion possible.